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(54) **Business record having a multicolor imagable surface.**

(57) A business record such as a form, tag, label or the like is provided in which different selected colored areas may be activated in a single pass through a printer. In one embodiment, coatings of initially colorless color formers and color developers are coated on selected areas of a substrate surface. The color formers and color developers combine upon exposure to an imaging force, such as heat or pressure, to form different colored visible areas on the sheet. In an alternative embodiment, the coatings of color formers and color developers are self-contained coatings having pressure-rupturable microcapsules containing either the color formers or said color developers.

FIG-3

The diagram shows a rectangular form with several sections. At the top, there is a large rectangular area labeled '26' which contains a multicolor imagable surface. This area is divided into two horizontal sections: the top section is labeled 'CONTROL NUMBER' and 'SPECIAL ORDER' (with '28' pointing to the 'CONTROL NUMBER' field), and the bottom section is labeled 'ITEM DESCRIPTION' and 'ITEM I.D. NUMBER' (with '32' pointing to the 'ITEM DESCRIPTION' field). Below these sections are three more fields: 'CODE (Lot No.)', 'TOTAL ON PALLET', and 'No. PALLETS IN LOT'. At the bottom of the form, there is a section labeled 'LOT CONTROL IDENTIFICATION TAG' which contains three sub-sections: 'Date Received / /', 'Date Used / /', and 'Initials'. The 'No. PALLETS IN LOT' field has a line for the number and the word 'of' followed by another line.

EP 0 623 909 A2

This invention relates to a business record, such as a form, label, tag, or the like, in which different selected areas may be activated thermally or through the application of pressure. More particularly, the invention relates to a sheet containing on its surface coatings of selected initially colorless color formers and color developers which, when subjected to heat or pressure, combine to form different colored areas on the sheet.

5 In the design and use of business forms, labels, tags, and the like, it is desirable to present information in an organized fashion so that information may be readily assimilated. For example, forms typically use headings or columns to identify different categories of information. Lines, rules, and screened areas are also used to delineate specific areas of information.

10 Color has also been used on business forms to delineate or differentiate information. For example, multipart forms, with each part being printed on different colored paper, have been in use for many years. The different color of each part of the form designates to whom that part is to be given or sent. Others have used different colored forms, labels, or tags to designate, for example, different methods of shipment of packages. As with multi-part forms, however, this method of designation requires that the user maintain an inventory of each different colored form, label, or tag.

15 To better differentiate categories of information, preprinted screened background areas are often printed in selected colors. One known method used for producing different colors is to apply colored inks during the printing process when the forms are being manufactured. However, such a process requires a separate printing station for each color of ink used. In addition, if the techniques of process color are used, different shades or hues of color can only be produced by printing two or more colors in a superimposed relationship onto selected areas of the form.

20 In the field of product labeling, direct thermal printing has been a well-known means of non-impact printing. Direct thermal printers are capable of forming colored images by the application of heat to a substrate containing heat-reactive chemicals thereon. Typically, a substrate such as paper is coated with a coating of color forming and color developing reactants which, when heated, combine to form a visible color. When such a coated substrate passes under the print head of a thermal printer, selected areas containing the coating are activated by the heated print elements, forming colored images on the surface of the substrate.

25 Thermally imagable coatings provide a convenient method of providing computer generated data such as bar codes or serial numbers. Such information may be printed on business forms such as labels or tags. Thermally coated substrates have also been widely used as facsimile paper, bar code paper for point-of-sale (POS) systems, automatic ticket vending machines, and labels for food products. There are various compositions and methods of applying thermally sensitive coatings as described, for example, in U.S. Patent Nos. 4,865,939, 4,861,749, and 4,894,359.

30 Another method of printing colored images is by applying heat at different temperatures or by applying different quantities of thermal energy to a coated substrate. For example, U.S. Patent No. 4,665,410 to Iiyama et al teach a multi-color thermosensitive recording material formed by applying three or more successively overlaid thermosensitive coloring layers to a support material with intervening decolorizing agent containing layers. Each coloring layer yields a different color depending on the quantity of thermal energy applied. However, such coatings must be applied separately. Also, it is believed that separate printing passes are needed to activate selected colors.

40 It is also possible to achieve colored images from the use of self-contained carbonless coatings which produce colored images upon the application of pressure such as that from an impact printer. Such coatings are well known, and typically contain dispersed color developers and initially colorless leuco dyes contained in solution within microcapsules.

45 However, these methods do not presently provide a means for achieving different selected colored areas on a form, label, tag or the like by printing in a single pass. Further, as the application of thermally sensitive coatings requires sophisticated coating equipment and techniques, it has heretofore been impractical to apply the coatings only in selected areas. Additionally, as thermally imagable coatings are typically applied to a high volume of substrates which are widely distributed for different end uses, manufacturers have produced fully coated webs or sheets to accommodate the greatest number of end uses of the products.

50 Accordingly, there still exists a need in the art for a business form, label, or the like having selected areas which produce selected colored areas when printed in a single pass through a direct thermal printer or an impact printing device.

55 The present invention meets that need by providing a business record such as a form, label, or tag having coatings of initially colorless color formers and color developers on selected areas which may be activated to produce a selected color or colors when imaged in a thermal printer or subjected to pressure or impact. The thermally imagable coatings may be applied in a cost effective manner by the manufacturer of the form, label, or tag on a selected area or areas of the form at the same time other routine operations are performed such as preprinting information on the form or die-cutting the form to produce labels or tags.

In accordance with one aspect of the invention, an imaggable business record such as a form, label or tag is provided comprising a substrate such as a sheet having first and second surfaces. Preferably, the sheet includes on selected portions of the first surface means for forming imaged areas comprising coatings of initially colorless color formers and color developers. The color formers and color developers combine and form a colored area upon application of an imaging force. More than one different colored area may be formed. Such an imaging force may take the form of heat, pressure or a combination of heat and pressure.

In one embodiment, the color formers and color developers combine upon exposure to heat from a thermal print head to form colored visible areas including images, symbols, indicia, or the like on the sheet. Preferably, the color formers comprise initially colorless leuco dyes, while the color developers preferably comprise acidic phenolic compounds or resins. The color formers and developers are preferably contained in a binder matrix as separately dispersed particulate solids. Exposure of the coating to heat causes selected reactants to melt, permitting the color former and color developer to mix and react. Alternatively, the color formers and color developers may comprise self-contained coatings of pressure rupturable microcapsules. In an alternative embodiment, the self-contained coatings may comprise solvent-soluble colored dye particles along with dispersed microcapsules containing a solvent for the dye particles. Such a self-contained coating is disclosed in U.S. Patent No. 5,039,652. When pressure is applied to the sheet, the capsules rupture and react with the dye particles to form colored visible areas.

It is also possible in the embodiments using self-contained coatings to activate selected areas of the sheet so that only one color is produced. The self-contained coatings may be coated in a number of different patterns as described above.

While it is possible to activate several areas so that multiple colors are formed on a document, it is also within the scope of the invention to activate selected portions of the coated areas which produce only one color. The coatings may be applied to a form, label, tag or the like in a number of different patterns. For example, the coatings may be applied only around the peripheral edges of a sheet. Alternatively, if a bar code is to be thermally imaged on a label, the coating may be applied to one section of a label where the bar code is to be printed.

In one preferred embodiment of the invention, the outer peripheral area of the sheet is coated with a color former and color developer which form a first color, a middle peripheral area adjacent the outer peripheral area is coated with a color developer and color former which form a second color, and the inner peripheral area adjacent the middle peripheral area is coated with a color former and color developer which form a third color. In another embodiment of the invention, the different coatings may be coated in an alternating side-by-side relationship about the periphery of the record. By activating selected areas, the periphery can be made to show a selected color.

The substrate may be precoated to provide a smooth and non-porous base coat for the thermally imaggable coating. The base coating may be applied to the entire surface of the substrate or only to the selected area of the substrate which is to receive the thermally imaggable coating. The base coating may comprise any suitable water-based, solvent-based or ultraviolet radiation or electron beam cured polymer.

In another preferred embodiment of the invention, a protective coating is provided over the area or areas containing the thermally imaggable coating to provide the subsequently printed thermal images with resistance to solvents, abrasion and fading due to exposure to light. The protective coating may be applied as a blend of electron beam curable oligomers and monomers, as a crosslinkable, water-based film forming prepolymer, or as a blend of ultraviolet radiation curable oligomers and monomers and a photocatalyst. The coatings are then cured or crosslinked to polymerize them.

In another embodiment of the invention, the sheet includes a plurality of columns, with each of the columns being coated with a color former and color developer which form a different selected color.

In an alternative embodiment of the invention, the substrate containing the thermally imaggable coating comprises a series of labels where the second surface of the substrate is coated with an adhesive. The adhesive may be a permanent or repositionable pressure sensitive adhesive, a hot melt adhesive, or other suitable adhesive. A release liner is preferably adhered to the pressure sensitive adhesive so that the series of labels may be fed through a thermal printer for imaging.

In yet another embodiment of the invention, a continuous web for producing a series of thermally imaggable business forms such as labels or tags is provided. The continuous web preferably includes first and second major surfaces, with the first surface of the web including a series of individual business records such as forms, tags, or labels, with each record including at least one selected area having a thermally imaggable coating of initially colorless color formers, and the remaining areas of the individual records left uncoated. The web may also include on its second surface an adhesive. Where a pressure sensitive adhesive is used, the adhesive is covered by a release liner.

The present invention also provides a method of making a thermally imaggable business record which in-

cludes the steps of printing indicia on selected portions of the first surface of the substrate and applying to at least one selected area of the substrate a thermally imagable coating of initially colorless color formers and color developers, leaving the remaining areas of the substrate uncoated. Alternatively, because the thermally-imagable coating of the present invention is applied as a high-solids content ink, the coating may be applied by conventional letterpress or offset gravure printing equipment.

In a preferred embodiment, the method includes the step of pre-coating the first surface of the substrate to provide a smooth and non-porous base coat prior to applying the thermally imagable coating. The method also preferably includes the step of applying a protective coating layer over the thermally imagable coating and then curing the coating. The coating may comprise a blend of electron beam curable oligomers and monomers, a crosslinkable, water-based film forming prepolymer, or a blend of ultraviolet radiation curable oligomers and monomers and a photocatalyst. The coatings are then cured or crosslinked to polymerize them.

In an alternative embodiment, the thermally imagable coating is applied to a series of areas on the substrate. The substrate is then die cut to form a series of labels. Preferably, the second surface of the substrate is coated with a pressure sensitive adhesive, and a release liner is adhered to the pressure sensitive adhesive.

Accordingly, it is a feature of the present invention to provide a business record such as a form, label, tag, or the like having on selected areas of its surface coatings of initially colorless color formers and color developers which, when exposed to an imaging force, are activated to form one or more different colored visible areas. Other features and advantages of the invention will be apparent from the following description, the accompanying drawings, and the appended claims.

In order that the invention may be better understood, reference will now be made, by way of example, to the accompanying drawings, in which:

Fig. 1 is a plan view of a business form having selected activatable areas of color in accordance with the invention;

Fig. 2 is a plan view of a business form in accordance with another embodiment of the invention;

Fig. 3 is a plan view of a tag or label in accordance with another embodiment of the invention;

Fig. 4 is a fragmentary sectional view of a business form illustrating another embodiment of the present invention;

Fig. 5 is a perspective view of a continuous web of labels in accordance with the present invention;

Fig. 6 is a plan view of a business form in accordance with another embodiment of the invention; and

Fig. 7 is a plan view of a label having on a selected area of its surface a thermally imagable coating.

The coatings utilized in the present invention may be applied to any document or record including business forms, labels, tags, or other documents in which it is desirable to selectively designate colored and/or thermally imagable areas. The document may be paper or other printable material including plastic or synthetic fiber web or sheet material normally used for labels, tags, forms, etc.

Suitable color formers for use in the present invention include colorless chromogenic dye precursors known in the art such as triphenyl methanes, diphenyl methanes, leuco dyes, xanthene compounds, thiazene compounds, and spiropyran compounds such as those described in U.S. Patent No. 5,102,856. Many different shades or hues of color may be produced on a document by combining color formers which form blue, yellow, green and red colors. Black images may also be produced by using a combination of color formers. Preferably, the color formers comprise from about 4 to 18% by weight of the coating formulation and are prepared as a dispersion in water containing 45-55% solids.

The color developers may be selected from acidic color developers known in the art such as zinc salicylate, acetylated phenolic resins, salicylic acid modified phenolic resins, zincated phenolic resins, novolac type phenolic resins, and other monomolecular phenols such as bisphenol A, 4,4'-isopropylidene diphenol, 4,4'-sulfonyl diphenol, p,p'(1-methyl-n-hexylidene)diphenol, p-tert-butyl phenol, and p-phenyl phenol. The color developer is preferably present in the coating formulation from about 7 to 15% by weight and is also preferably prepared as a dispersion in water containing 45-55% solids.

In addition, the coating contains from about 40-70% by weight water, and from about 5 to 25% by weight of a sensitizer. Such sensitizers are low melting point solids which, when subjected to heat, melt and become solvents for the color forming and developing reactants. Suitable sensitizers include B-naphthol benzyl ether, p-benzyl biphenyl, ethylene glycol-m-tolyl ether, m-Terphenyl, Bis [2(4-methoxy) phenoxy] ether, and dibenzyl oxalate.

A binder is also included in the coatings to improve the rheological properties of the coating for better printability and to promote good adhesion of the coatings to the sheet surface. Suitable binders include starch, casein, polyvinyl alcohol, polyvinyl pyrrolidone, acrylamide/acrylate copolymers, carboxylated styrene butadiene latex, styrene acrylic latex, and mixtures thereof. Preferred for use in the present invention is a starch solution in water containing 12-40% solids, and a solution of a water soluble polymer or copolymer in water containing 30-35% solids. The starch solution comprises 15-35% by weight of the coating, and the polymer solution com-

prises 5-20% by weight of the coating.

The coating formulation may also optionally include from about 5 to 30% by weight of a pigment such as calcined clay, calcium carbonate, or plastic pigments. Other optional ingredients include from about 5 to 25% by weight of a lubricant and from about 1 to 10% by weight of an anti-fading agent. Suitable lubricants include zinc stearate, stearamide, and wax. The anti-fading agent may comprise hindered phenols of the antioxidant class such as 1,1,3-tris(2-methyl-4-hydroxy-5-cyclohexylphenyl) butane.

The coatings are generally applied to the business record substrate by any suitable coating or printing process including flexographic, letterpress, or gravure printing techniques. However, any suitable coating or printing process may be used including direct gravure or screen processes. The coatings may be applied in selected areas which can form blocks of background color, or they may be applied so as to form images, symbols, stripes, borders, and the like when passed through a thermal printer. Coatings which produce different colors are preferably coated or printed separately on each desired portion of the document. The coatings are preferably applied at a dry coating weight of between about 0.50 and 2.50 lbs/17"x22"x500 sheet ream (1.9 to 9.5 gm/m<sup>2</sup>), and may be selectively printed or coated on the surface of stock papers during the manufacturing process.

The substrate is preferably pre-coated to provide a smooth and non-porous base coat for the thermally imagable coating. The base coat comprises any suitable water-based, solvent-based, or ultraviolet light or electron beam curable polymer which may be applied in liquid form. Examples of such suitable base coating compositions are taught in commonly-assigned published PCT International Application No. WO 90/13064, published November 1, 1990.

If desired, the color former and color developer coatings may be overcoated with a protective coating composition which provides the subsequently printed colored areas on the substrate with resistance to solvents, abrasion and fading from exposure to light. An example of such a composition is disclosed in Mehta, U.S. Patent No. 4,999,334.

If the color formers and color developers are applied as self-contained coatings for imaging by mechanical force as by pressure or impact, the coatings are preferably applied at a dry coating weight of between about 0.30 and 3.00 lbs/17"x22"x500 sheet ream (1.14 to 11.4 gm/m<sup>2</sup>). In this embodiment, the color former-containing microcapsules may be produced by any method known in the art; however, a preferred method of microencapsulation is disclosed in Seitz, U.S. Patent No. 4,889,877.

With reference to the drawings, it must be appreciated that requirements for solid black line drawings on a white surface make illustration of some of the subtleties of our invention relating to different colors difficult by the required drawings alone. Reference to the following detailed description of the illustration will make full appreciation of the drawings and our invention possible.

As can be seen in the drawing figures, the color former and color developer coatings may be printed on one or more selected portions of a document in a number of patterns, depending on the desired application. It should be appreciated that many different combinations for placement of the coatings on a document are possible and are within the scope of this invention.

Referring now to Fig. 1, a business record 10 is shown comprising a sheet having first and second surfaces. The first surface of the sheet includes selected portions 12, 14, and 16 around the periphery of the record containing coatings of initially colorless color formers and color developers. The outer peripheral area 12 of the sheet is coated with a color former and color developer which form a first color, the middle peripheral area 14 adjacent the outer peripheral area is coated with a color developer and color former which form a second color, and the inner peripheral area 16 adjacent the middle peripheral area is coated with a color former and color developer which form a third color.

As shown in Fig. 6, the coatings may also be applied in alternating side-by-side relationship about the periphery of the record. For example, block 46 is coated with a color former and color developer which form a first color, block 48 is coated with a color former and color developer which form a second color, and block 50 is coated with a color former and color developer which form a third color. Such an arrangement allows one color to be selectively activated around the boundary of the form to provide an indication of how the form is to be processed.

Direct thermal printers currently in use in the art include print heads or print bars with small heated elements which are individually addressable by digital input from a controlling computer. When the record is passed under the print head or print bar of a thermal printer, selected heated elements are activated and heat selected areas on the record. The coating in the selected areas is heated, causing at least one component of the coating to melt and permit the color formers and color developers to combine to form a visible color. For example, portion 12 of the document may include a coating which produces a red color, portion 14 may include a coating which produces a blue color, and portion 16 may include a coating which produces a yellow color. The thermal printer can be programmed to activate all of the colors, or only selected colors. Both the colored

areas and printed information on the record can be formed in a single printing pass. Thus, by selecting which colored area to activate, one can produce a color-coded document which imparts information to an end user. For example, the color of the document may be used as an indication of which department in an organization to which the document is to be routed. Additionally, the document may be in the form of a tag or label which is attached to an article or package, with the color providing an indication of method of shipment. The possible uses of the invention are many and varied.

Fig. 2 illustrates another embodiment of the invention in which a business record 18 includes columns 20, 22 and 24 which are color activatable areas. The first column 20 is coated with a color former and color developer which form a first color, the second column 22 is coated with a color former and color developer which form a second color, and the third column 24 is coated with a color former and color developer which form a third color. In this manner, different categories or types of information can be emphasized or delineated without having to use preprinted colored screened areas.

Figs. 3 and 4 illustrate another embodiment of the invention in which a tag is provided having selected areas 28, 30 and 32 which may be activated to produce color upon the application of pressure. The tag 26 has been coated with self-contained coatings 34 comprising encapsulated color formers and color developers. As shown in Fig. 4, when an imaging force, indicated by the arrow, applies pressure to the surface of the document containing the self-contained coating 34, the color former and color developer combine to form a colored visible image 36 in the area beneath the imaging force. As shown in Fig. 3, area 28 is coated with a self contained coating which forms a first color, area 30 is coated with a self-contained coating which forms a second color, and area 32 is coated with a self-contained coating which forms a third color.

Alternatively, the coatings 34 may comprise solvent-containing microcapsules and solvent soluble colored dye particles. When the capsules are ruptured by an imaging force, the dye particles are dissolved by the released solvent and form a color. Such self-contained coatings usually exhibit a light colored tint before imaging. After the solvent-containing microcapsules are ruptured, more intense color is formed as dye particles are dissolved by the released solvent.

In another embodiment of the invention illustrated in Fig. 5, a continuous form 38 is shown which contains a series of labels which are coated in selected areas to create different colored areas when printed with a thermal printer. If desired, the web may be preprinted with nonvariable, repetitive information by automated equipment and then coated in accordance with the present invention so that variable information may be printed in the color activatable areas. For example, as shown in Fig. 5, areas 44 contain preprinted information, area 40 is coated with a color former and color developer which forms a first color, and area 42 is coated with a color former and color developer which form a second color. Alternatively, the entire surface of the continuous form may be coated with self-contained coatings and printed using an impact printing device.

Referring now to Fig. 7, a label 10 is shown comprising an substrate having first and second surfaces. The first surface of the sheet includes a selected area 12 containing a thermally imagable coating of initially colorless color formers and color developers and an uncoated area 14 which contains preprinted indicia. As shown, the thermally coated area 12 has been imaged to provide variable information as well as bar coded information on the label.

Direct thermal printers currently in use in the art include print heads or print bars with small heated elements which are individually addressable by digital input from a controlling computer. When the record is passed under the print head or print bar of a thermal printer, selected heated elements are activated and heat selected areas on the record. The coating in the selected areas is heated, causing at least one component of the coating to melt and permit the color formers and color developers to combine to form a visible color. For example, the thermal printer can be programmed to print varied information in one selected area as shown in Fig. 7.

The invention provides the advantage that one form may be printed with several different activatable color combinations instead of using multi-ply labels or forms which require a different color for each ply. In addition, the invention provides a means of emphasizing or designating different categories of information on a form without having to use preprinted colored screened areas which require separate printing stations. As the coatings are initially colorless, the entire record, form, label, or tag may be initially white, and only the information and colors required for that particular form can be activated. This permits the user to print color customized records as needed.

The invention also provides the significant advantage that a business form may be provided with a thermally imagable coating only in those areas which are to be subsequently imaged. In addition, the method is convenient and cost-effective because the coating is a high-solids content ink which can be applied in line at the same time other steps are being performed such as preprinting information, die-cutting labels, etc. For example, a preferred process of making the business records of the present invention includes printing fixed or variable indicia on the substrate, followed by application of the thermally imagable coating to one or more

selected areas or to the entire surface of the substrate, then die-cutting the substrate, and perforating and folding the die cut labels.

Further, the invention has the advantage that both information and the colored areas on the document may be achieved by printing in a single pass through a thermal or impact printer.

Other uses for the present invention include airline tickets or event tickets. For example, different colors could be activated on an airline ticket to designate first class or coach seating. The invention could also be used for shipping labels in which different colors are activated to designate the method or location of shipment. Other potential uses for the present invention will be apparent to those skilled in the art.

In order that the invention may be more readily understood, reference is made to the following examples which are intended to illustrate the invention, but not limit the scope thereof.

#### Example 1

The following materials were combined to produce a preferred coating formulation:

	<u>Weight %</u>
Color former <sup>1</sup>	11.5
Color developer <sup>2</sup>	12.0
Sensitizer <sup>3</sup>	7.5
Binder <sup>4</sup>	3.5
Water	46.5
Pigment <sup>5</sup>	20.0

<sup>1</sup>OBD-2 from Nagase America Corporation

<sup>2</sup>Bisphenol A from Nagase America Corporation

<sup>3</sup>m-Terphenyl from Nagase America Corporation

<sup>4</sup>Polyvinyl alcohol from Air Products Company

<sup>5</sup>Calcium carbonate from J.M. Huber Company

#### Example 2

The following materials were combined and blended by mild agitation to produce a preferred thermally im-  
ageable coating formulation:

	<u>Weight %</u>
Color former <sup>1</sup>	8
Color developer <sup>2</sup>	13
Sensitizer <sup>3</sup>	12
Binder <sup>4</sup>	20
Water	47

<sup>1</sup> Black 305 from Nagase America

<sup>2</sup> Bis(3-allyl-4-hydroxyphenyl) sulfone from Nagase America

<sup>3</sup> p-benzyl biphenyl from Nagase America

<sup>4</sup> Starch solution and polyvinyl alcohol from Penford Products

While certain representative embodiments and details have been shown for purposes of illustrating the invention, it will be apparent to those skilled in the art that various changes in the methods and apparatus disclosed herein may be made without departing from the scope of the invention, which is defined in the appended claims.

# Claims

1. An imagable business record (10) in which one or more different selected areas may be activated to form colored images or areas comprising:  
 5       a substrate having first and second major surfaces, said first surface of said substrate including on one or more selected portions thereof an imagable coating of initially colorless color formers and color developers, with the remaining areas of said substrate not containing said imagable coating.
2. A business record (10) as claimed in claim 1 wherein said color formers and color developers combine to form colored visible areas when exposed to an imaging force of either heat or pressure.
3. A business record (10) as claimed in claim 2 wherein said colored visible areas include images, symbols, or indicia.
- 15   4. A business record (10) as claimed in claim 1 wherein only one selected colored area is activated.
5. A business record (10) as claimed in claim 1 wherein the outer peripheral area (12) of said substrate is coated with a color former and color developer which form a first color, a middle peripheral area (14) adjacent said outer peripheral area is coated with a color developer and color former which form a second color, and an inner peripheral area (16) adjacent said middle peripheral area is coated with a color former and color developer which form a third color.
- 20   6. A business record (18) as claimed in claim 1 wherein said substrate includes a plurality of columns (20), (22), (24), wherein each of said columns is coated with a color former and color developer which form a different selected color.
- 25   7. A business record (10) as claimed in claim 1 comprising a continuous web (38) for producing a series of imagable business records.
- 30   8. A business record (10) as claimed in claim 1 wherein said coatings comprise self-contained coatings (34) of pressure-rupturable microcapsules containing either said color formers or said color developers.
9. The business record (10) as claimed in claim 8 wherein the outer peripheral area (12) of said substrate is coated with a self-contained coating which forms a first color, a middle peripheral area (14) adjacent said outer peripheral area is coated with a self-contained coating which forms a second color, and an inner peripheral area (16) adjacent said middle peripheral area is coated with a self-contained coating which forms a third color.
- 35   10. A business record (18) as claimed in claim 8 wherein said substrate includes a plurality of columns (20), (22), (24), wherein each of said columns is coated with a self-contained coating which forms a different selected color.
- 40   11. A business record (10) as claimed in claim 8 wherein at least one selected area of said first surface of said substrate has been pre-coated to provide a smooth and non-porous base coat for said thermally imagable coating.
- 45   12. A business record (10) as claimed in claim 8 including a protective coating over said thermally imagable coating, wherein said protective layer is selected from the group consisting of electron beam cured polymers, crosslinked water-based polymers, and ultraviolet radiation cured polymers and a photocatalyst.
- 50   13. A business record (10) as claimed in claim 8 comprising a series of labels on said substrate, wherein said second surface of said substrate is coated with a pressure sensitive adhesive and a release liner is adhered to said pressure sensitive adhesive.
- 55   14. A process for producing an imagable business record comprising the steps of:
  - a) providing a substrate having first and second major surfaces,
  - b) printing fixed or variable indicia on at least one surface of said substrate, and
  - c) printing an imagable coating composition on said first surface of said substrate comprising initially colorless color formers and color developers.



15. The process as claimed in claim 14 wherein said substrate is a continuous web.

16. The process as claimed in claim 14 including the step of die-cutting said web to form a series of individual business records.

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17. The process as claimed in claim 16 including the steps of perforating and folding said individual business records.

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FIG-1

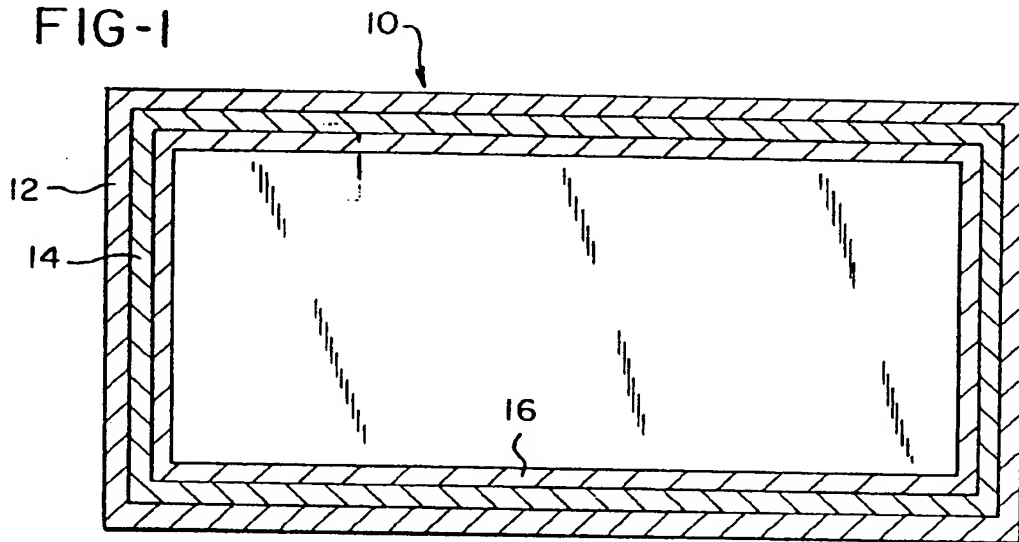


FIG-4

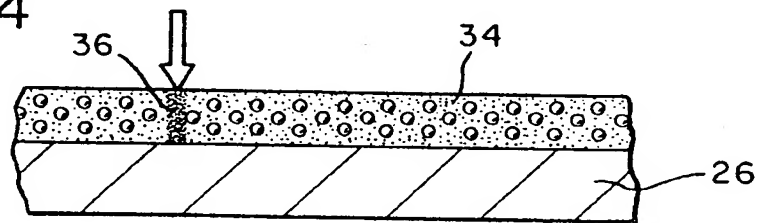
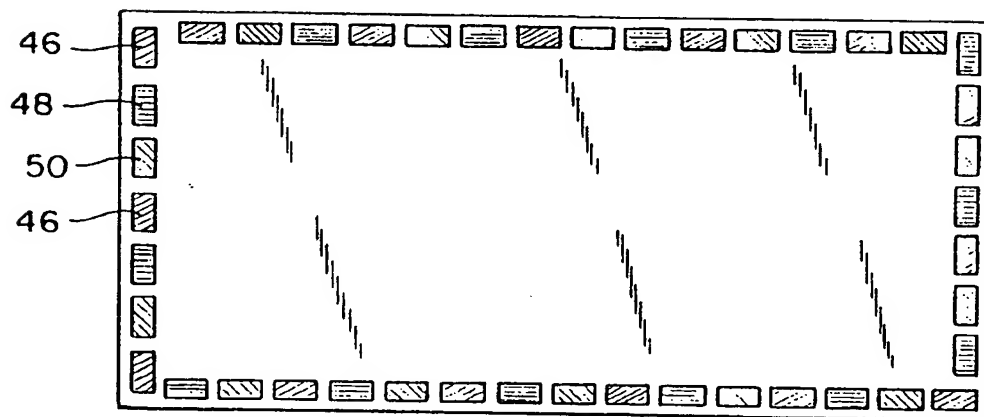


FIG-6



COMBINATION STATEMENT /  
REMITTANCE MAILER

**YOUR Company Name**  
**Anywhere**  
**USA**

MO.	DAY	YR	REFERENCE	CHARGES	CREDITS	BALANCE
				20	22	24

# STATEMENT

**RETAIN THIS COPY**

Account No.

5

Pay This Amount

FIG-3

The diagram shows a rectangular tag with several sections. At the top, a large rectangular area is labeled 26. Below it, a section labeled 28 contains a grid of small circles, with a callout 30 pointing to it. Below this, a section labeled 32 contains a grid of small circles, with a callout 34 pointing to it. Below the grid, there are three rows of text: 'SPECIAL ORDER', 'ITEM DESCRIPTION', and 'ITEM I.D. NUMBER'. Below these, there is a row labeled 'CODE (Lot No.)' and 'DATE'. Below this, there is a row labeled 'TOTAL ON PALLET'. Below that, there is a row labeled 'No. PALLETS IN LOT' followed by a line and the word 'of' followed by another line. At the bottom, there is a section labeled 'LOT CONTROL IDENTIFICATION TAG' and a table with three rows: 'Date Received / /', 'Date Used / /', and 'Initials'.

CONTROL NUMBER	
SPECIAL ORDER	
ITEM DESCRIPTION	
ITEM I.D. NUMBER	
CODE (Lot No.)	
DATE	
TOTAL ON PALLET	
No. PALLETS IN LOT _____ of _____	
LOT CONTROL IDENTIFICATION TAG	
Date Received	/ /
Date Used	/ /
Initials	

FIG-5

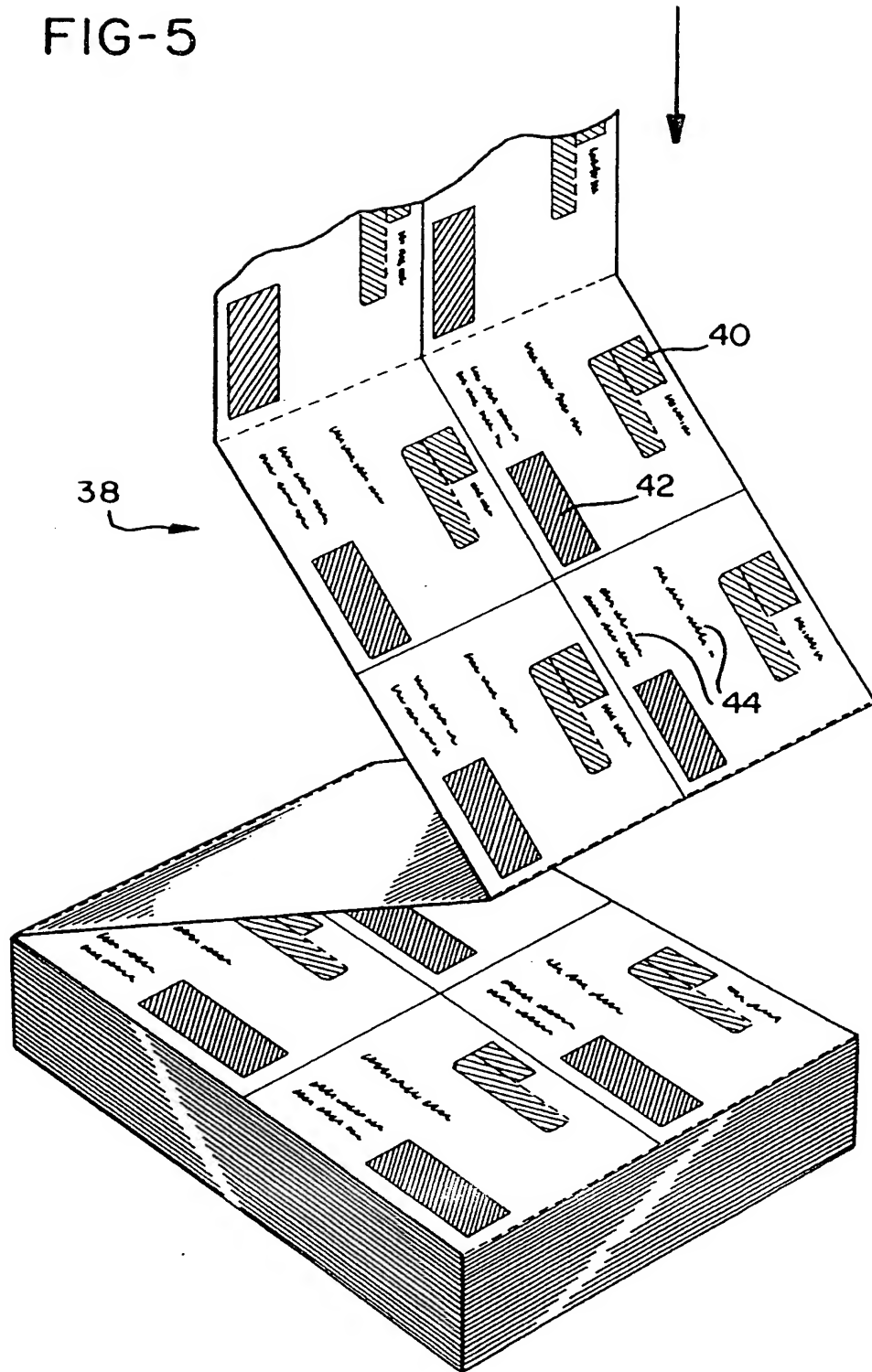


FIG - 7

